1 **Q.** **Provide a list of worst performing feeders eventually included for reliability work**
2   **and included in Newfoundland Power's capital Distribution Reliability Initiative**
3   **Projects for each year since 2004. Also describe, in general, the analytical process**
4   **used for selecting worst performing feeders for the Distribution Reliability Initiative**
5   **Projects.**
6
7 A. The worst performing feeders upon which reliability work was carried out over the period
8   from 2004 to 2014 are listed in Table 1.
9
10

Table 1
Distribution Reliability Initiative

2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
WES-02	WES-02	BCV-02	None	BOT-01	NWB-02	NWB-02	None	None	None	None
BRB-04	GBY-02	BOT-01		LEW-02	LEW-02					
PUL-01		LEW-02		GLV-02	GLV-02					
PUL-02		GBY-02								
		GPD-01								
		GLV-02								
		SMV-01								

11
12
13   In general, the Company's distribution maintenance practices, including the process used
14   for selecting worst performing feeders for inclusion in the Distribution Reliability
15   Initiative projects is described in the response to Request for Information PUB-NP-068.
16
17   Additional information on the analytical process used for selecting worst performing
18   feeders for the Distribution Reliability Initiative is detailed in the response to Request for
19   Information PUB-NP-006 in Newfoundland Power 2015 Capital Budget Application.
20   Commencing with its 2015 Capital Budget Application the Company has introduced 2
21   new reliability indices, Customer Interruption per Kilometre and Customer Hours of
22   Interruption per Kilometre.
23
24   The response to Request for Information PUB-NP-006 of Newfoundland Power 2015
25   Capital Budget Application is provided in Attachment A.

Response to Request for Information PUB-NP-006
Newfoundland Power's 2015 Capital Budget Application

Requests for Information

1 **Q.**   **4.1 Distribution Reliability Initiative**
2
3   **Page 1 of the report state "In 2012 the Canadian Electricity Association began**
4   **reporting on 2 additional indices; Customer Hours of Interruption per Kilometer**
5   **("CHIKM") and Customers Interrupted per Kilometer ("CIKM"). CHIKM and**
6   **CIKM are used to rank the reliability performance of distribution feeders on the**
7   **length of line exposed to the outage."**
8
9   **Describe how Newfoundland Power uses these new indices either by themselves or**
10   **in conjunction with other indices to rank its feeders when deciding where it should**
11   **allocate its capital for the maximum leverage.**
12
13 A.   There are numerous reliability indices used by utilities and regulatory authorities to
14   evaluate the frequency and duration of customer outages. SAIDI and SAIFI are customer
15   based indices that normalize reliability data on a customer basis.[1] They are an indication
16   of the service continuity that customers experience. CHIKM and CIKM are plant based
17   indices that normalize reliability data on the basis of kilometres of distribution plant in
18   service.[2] They are an indication of plant condition. When evaluating reliability
19   performance both customer based statistics and plant based statistics provide useful
20   information.
21
22   To illustrate the value of considering both perspectives, consider two distribution feeders
23   of 10 km and 100 km respectively. Each serves 1,000 customers. If each of the two
24   feeders were exposed to 20 events which caused the same number of customer
25   interruptions (say, 10,000 aggregate interruption) and customer hours of interruption
26   (say, 20,000 aggregate hours of interruptions), the statistical conclusion would differ
27   depending upon the indices used. The SAIDI and SAIFI would be the same for both
28   feeders.[3] However, the CHIKM and CIKM would indicate that reliability for the 10 km
29   feeder was 10 times worse than the reliability for the 100 km feeder.[4]
30
31   From an engineering perspective, it is widely accepted that system reliability is largely a
32   function of the condition of electrical system assets.[5] Use of CHIKM and CIKM will

---

[1] SAIDI is the system average interruption duration index and is calculated by dividing aggregate customer hours of outages by the number of customers served. SAIFI is the system average interruption frequency index and is calculated by dividing aggregate number of customer interruptions by the number of customers served.

[2] CHIKM is the customer hours of interruption per kilometer and is calculated by dividing aggregate customer hours of outages by the kilometers of distribution plant. CIKM is the customers interrupted per kilometer and is calculated by dividing aggregate number of customer interruptions by the kilometers of distribution plant.

[3] SAIDI would be 20 (20 = 20,000/1,000) and SAIFI would be 10 (10 = 10,000/1,000) for both the 10 km and 100 km feeders.

[4] CHIKM for the 10 km feeder would be 2,000 (2,000 = 20,000/10) and for the 100 km feeder would be 200 (200 = 20,000/100). CIKM for the 10 km feeder would be 1,000 (1,000 = 10,000/10) and for the 100 km feeder would be 100 (100 = 10,000/100).

[5] This was recognized in, amongst other places, the 1991 *Report on the Technical Performance of Newfoundland Light & Power Co. Limited*, prepared by George Baker, P.Eng., for the Board.

Newfoundland Power

Requests for Information

1   simply provide an additional screen for assessing the reliability performance of
2   Newfoundland Power's distribution feeders. In the past Newfoundland Power relied on
3   SAIDI and SAIFI to identify feeders on which to perform a detailed reliability
4   assessment. On a go forward basis, CHIKM and CIKM will be used in conjunction with
5   SAIDI and SAIFI to identify feeders for reliability assessment.[6]
6
7   As in the past, reliability indices will be used only to *identify* feeders upon which detailed
8   reliability assessment will be performed. The worst 15 performing feeders for each of
9   customer minutes, SAIDI, SAIFI, CHIKM and CIKM will be identified on an annual
10   basis. An engineering review will be performed on all identified feeders. Where
11   necessary, a detailed engineering inspection will determine if any work, capital or
12   otherwise is required.
13
14   The addition of CHIKM and CIKM as screens for assessing reliability performance will
15   not necessarily result in materially increased expenditures to improve distribution
16   reliability.[7] It will however, result in a more informed screening process which should
17   result in more cost effective reliability assessment and improvement over the long term.

---

[6]   In the Distribution Reliability Initiative June 2014 report Newfoundland Power has presented 5 reliability
      indices in Appendix A, customer minutes of interruption, SAIFI, SAIDI, CHIKM and CIKM. The 5 separate
      reliability indices identified a total of 42 distribution feeders as candidates for *worst performing feeders*. The
      reliability data for these 42 feeders were examined to determine if an engineering review was warranted.
[7]   The 2015 Distribution Reliability Initiative identified 42 distribution feeders for assessment. Work is being
      proposed for two distribution feeders in 2015.

Newfoundland Power